Potential Market for Non-GMO Corn and Soybeans

A critical factor in determining the effects on farmers, the transportation industry, and processors from the emerging demand for non-genetically modified organism (GMO) corn and soybeans is the magnitude of the new demand relative to the demand for GMO or mixed corn and soybeans. If the demand for non-GMO corn and soybeans is large relative to the supply, severe market disruptions may occur as processors scramble to locate and purchase non-GMO crops. If the new demand is relatively small, marketing of the 1999 crop may not be affected.

To date, consumers in the European Union (EU), Japan, and other countries have begun to demand that their food be produced without GMO corn and soybeans. This presents a potential problem for U.S. farmers and processors because the EU and Japan are two of the largest markets for U.S. corn and soybeans. The EU imports large amounts of soybeans and corn gluten—a byproduct of U.S. ethanol production—and Japan is a large importer of corn and soybeans.

A great deal of uncertainty exists concerning the extent to which U.S. processors and exporters will demand non-GMO corn and soybeans in 1999. However, upper-limit estimates can be made by looking at how the 1998 U.S. corn and soybean crops were utilized.

As shown in Figure 1, the 1998 U.S. corn crop was used to feed domestic livestock, exported, processed into food and corn sweeteners, or used to produce ethanol. A small portion was used to produce seed for the 1999 crop and about 5 percent of the crop was stored. The present source of demand for non-GMO corn is from the food processing industry. If the entire U.S. food processing industry switched to non-GMO corn, the market for non-GMO corn would constitute 8 percent of the corn market. If the sweetener industry joined the food processing and ethanol industries, non-GMO corn would constitute 14 percent of the corn market.
At first glance there seems to be no reason for ethanol producers to demand non-GMO corn, but a byproduct of ethanol production is corn gluten. In the 1998/99 marketing year, exports to Europe of corn gluten were worth $520 million. If European customers demand corn gluten made from non-GMO corn, another 6 percent, for a total of 20 percent, of the corn market would move to non-GMO corn. There seems to be no reason for this demand to materialize, however, because corn gluten is fed to livestock.

And finally, while 80 to 90 percent of exported U.S. corn is fed to livestock, a small portion is processed into food products. Hence, some international food processors may demand non-GMO corn. If difficulties arise in segregating non-GMO corn from GMO corn at export terminals, the entire export market could move to non-GMO corn, in which case another 17 percent of the market for U.S. corn could be for non-GMO corn. This implies that an upper limit on the market share for non-GMO corn is 37 percent.

The current demand for non-GMO soybeans is comprised of a portion of the soybeans exported, a portion of the soybeans crushed domestically and exported as soybean products (oil and meal) that are used in food processing, and a portion of soybeans crushed domestically and used to produce food that is exported. Figure 2 shows distribution of the 1998 U.S. soybean crop. The percentages are based on weight.

One cannot simply add the percentages shown in Figure 2 to come up with a potential non-GMO soybean market because oil and meal are produced together in fixed proportions. Thus, if consumers demand non-GMO soybean oil, then the soybean meal produced in conjunction with the oil will also be non-GMO even if there is no consumer demand for non-GMO meal. This constraint holds true for both soybeans crushed domestically and soybeans exported and crushed abroad.

For example, the soybean oil export market represents 2 percent of the soybeans by weight but 14.6 percent of the total domestic soyoil production. Thus 14.6 percent of the soybeans crushed domestically would have to be non-GMO soybeans if the soybean oil export market were to switch to non-GMO soybeans. If the domestic soybean oil market were to follow suit, 100 percent of the domestically crushed soybeans would have to be non-GMO. Thus, if all domestic and international food processors demand non-GMO soybean oil, 100 percent of the oil and meal markets would go non-GMO.

A more likely scenario is that a portion of the soybean export market and a portion of the soybean oil export market will switch to non-GMO soybeans. If both markets switched completely, it would constitute 31.6 percent of the soybeans produced in 1999, based on 1998 utilization patterns.

**GATT: Did It Make A Difference?**

The initial discussions of the World Trade Organization (WTO) ministers will likely center around one question: did the General Agreement on Trade and Tariffs (GATT) make a difference?

What GATT intended to accomplish

The historic Uruguay Round Agreement on Agriculture (URAA) accomplished what had long eluded the GATT, that of putting trade in agriculture under the same umbrella as other sectors (e.g., manufacturing). In particular, the URAA aimed to dismantle trade-distorting policies through ensuring and expanding market access, and limiting domestic support and export subsidy. However, even prior to the signing of the final act, questions were raised about the wide latitude in the rules of implementation, which some feared might frustrate the intent of ushering in an era of true liberalization in agricultural trade.

Using the beef and wheat markets as specific cases, this article looks at whether GATT reforms improved

- market integration, (i.e., the degree shocks arising in one market price are passed on to other market prices), and
- efficiency (i.e., the speed of price adjustment in periods of disequilibrium)

The pre-GATT world beef and wheat markets were highly protected by measures that impeded market integration and efficiency. The URAA reforms expanded access in beef markets through tariff quotas (TRQ). This market access represented approximately 24 percent of world beef trade at the beginning of the implementation period in 1995. The URAA reduced the maximum amount of allowable subsidized beef exports, representing 31.2 percent of trade, and reduced the maximum amount of allowable subsidized wheat exports by 31 percent at the end of the implementation period.

The five-year record

The URAA radically changed domestic and trade policies of several countries that are
significant players in the world beef market. The European Union (EU) ended its variable levy, and imposed a limit on export subsidy. The United States replaced its quota under the Meat Import Law with a TRQ. Japan abolished the beef import quota and replaced its base rate of 93 percent to 50 percent bound rate, which was to further decline to 38.5 in the year 2000. Mexico liberalized its imports of fresh, chilled, and frozen beef, courtesy of the North American Free Trade Agreement (NAFTA), and full liberalization of beef variety meats should follow by 2003.

How has GATT affected the fundamental market equilibrium relationships? Researchers at CARD-FAPRI tested the Pacific beef market price equilibrium using the U.S. and Australia beef price, and tested the Pacific-Atlantic beef market price equilibrium using the Australia and Argentina beef price. Australia and U.S. wheat prices were used for the wheat market price equilibrium. All the tests found a long-run equilibrium in the pre-GATT and post-GATT periods for beef and wheat prices. 2

Improved market efficiency
The GATT was found to promote market efficiency in the world beef and wheat markets and to significantly improve the speed of adjustment. For example, when the U.S. and Australia beef prices departed from their long-run equilibrium relationship, the speed of adjustment toward a new equilibrium doubled in the Pacific beef market. And the fundamental relationship of beef prices between the segmented Pacific and Atlantic beef markets improved significantly. The continuing segmentation of the two markets, however, may have been strengthened under the GATT agreement on sanitary and phytosanitary measures. The improved speed of price adjustment may be explained by the increasing across-market beef trade between the United States and the Russian Federation, and Argentina and the United States in more recent years. The same results are repeated in the wheat market, where the fundamental relationship of Australia and U.S. wheat prices significantly improved, and the speed of adjustment also increased.

Improved market integration
There is an improved degree of market integration in the post-GATT period as evidenced by the more widespread and faster transmission of price variability in both the beef and wheat markets. The long-run variability of the U.S. beef price that is explained by unexpected shocks of the Australian beef price has increased from more than 14 percent in the pre-GATT regime to nearly 30 percent in the post-GATT regime. Moreover, the speed at which those unexpected shocks are reflected in the U.S. beef price has improved significantly. Conversely, the long-run variability of the Australia beef price explained by the unexpected shocks of the U.S. beef price increased from more than 14 percent in the pre-GATT regime to nearly 46 percent in the post-GATT regime. The same significant improvement in the transmission of price variability is observed for the wheat price. The maximum share of shocks in the Australia wheat price to the variability of the U.S. wheat price doubled from 20 percent in the pre-GATT regime to 43 percent in the post-GATT regime. The same can be said for the maximum share of shocks of U.S. wheat price on the variability of the Australia wheat price, which more than doubled from 19 to 46 percent.

What lies ahead
One of GATT’s significant contributions in the past five years has been the improvement of market integration and efficiency as evidenced by the beef and wheat markets. With this successful track record, the contracting parties to the WTO should have enough reason to take even bolder steps in dismantling remnants of protection in the new round of trade negotiations. There is still room for further liberalization, such as lowering bound rates, reducing subsidized exports, reducing “blue box” support, and better implementation of TRQs. Moreover, newer challenges like the “multifunctionality” and genetically modified organism (GMO) issues should be approached using scientific bases rather than trade distortionary rules.


1 Another feature of the world beef market that impeded on market efficiency is its segmentation into the Pacific and Atlantic beef market, where the latter represents beef trade among countries where foot-and-mouth disease (FMD) is endemic. While countries with FMD are able to import from countries without FMD, they could not export frozen, fresh, and chilled beef products to FMD-free countries. Australia and the U.S. are major players in the Pacific market, while Argentina and the EU are the major players in the Atlantic market.

2 Data used in the study are monthly beef and wheat prices from the International Financial Statistics covering the period June 1986 to April 1998. Beef prices are for frozen beef in U.S. dollar per pound. U.S. beef price is FOB New York, while Australia and Argentina beef prices are CIF in U.S. East Coast port. Wheat prices are in U.S. dollar per bushel. U.S. wheat price is hard red winter wheat FOB Gulf of Mexico ports, while Australia wheat price is Wheat Board export price.

Studies on the impact of GATT are abundant in the literature. However, most studies focus on the impact of GATT on economic activities such as production, consumption, trade, and prices. Scant attention has been paid to the impact of GATT in improving the functioning of institutions, such as the world agricultural commodity markets. The FAPRI-CARD study summarized in this issue of FAPRI Bulletin helps fill the gap.

In the pre-GATT period, the trade policy distortions and segmentation of the market may have corrupted the price transmission between the Pacific and Atlantic beef markets at – 0.065. This was corrected under the GATT regime, with a price transmission elasticity of 0.07, and the speed of adjustment by 2.4 times from 0.246 to 0.592. Within the Pacific market, the fundamental relationship of Australia and U.S. beef prices significantly improved, with the long-run transmission elasticity implied in the cointegrating vector increasing from 0.243 in the pre-GATT period to 0.289 in the post-GATT period.
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